AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (currently amended) A contaminant molecule sensor configured for use in a vacuum environment, the sensor comprising:

an electrochemical cell comprising

a measurement electrode comprising a catalyst selected for its ability to ~~catalyse~~ catalyze the dissociation of a contaminant molecule into its ionic species~~,~~;

a reference electrode comprising a catalyst selected for its ability to ~~catalyse~~ catalyze the dissociation of a reference molecule into its ionic species~~,~~; and

a solid-state ionic species conductor bridging the measurement electrode and the reference electrode, the conductor being selected to conduct an ionic species common to the dissociated contaminant and reference molecules~~,~~; and

means for initiating ~~the~~ catalysis of the dissociation of the reference and contaminant molecules.

2. (currently amended) The~~A~~ sensor according to Claim 1, wherein the means for initiating the catalysis of the dissociation of the reference and contaminant molecules comprises means for controlling and monitoring the temperature of the cell.

3. (currently amended) The~~A~~ sensor according to Claim 2, comprising means for separating a reference environment space from a monitored environment space, the means for controlling and monitoring the temperature of the cell including a heating device contained within the reference environment space.

4. (currently amended) The~~A~~ sensor according to Claim 2~~ or Claim 3~~, wherein the means for controlling and monitoring the temperature includes an electrically powered heater.

5. (currently amended) The~~A~~ sensor according to Claim 4, wherein the electrically powered heater comprises nichrome wire.

6. (currently amended) The~~A~~ sensor according to any of Claims 2~~ to 5~~, wherein the means for controlling and monitoring the temperature includes a temperature sensor.

7. (currently amended) The~~A~~ sensor according to Claim 6, wherein the temperature sensor is a thermocouple.

8. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, comprising a vacuum feed-through connection for providing an electrical connection to the measurement electrode.

9. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, comprising seals for connection to a vacuum environment.

10. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein a reference environment space is at least partly bounded by the reference electrode and is open to the ambient atmosphere.

11. (currently amended) The~~A~~ sensor according to ~~any of~~ Claims 1~~ to 9~~, wherein a reference environment space is at least partly bounded by the reference electrode and is enclosed by a seal.

12. (currently amended) The~~A~~ sensor according to Claim 11, wherein electrical cables for connecting the electrodes and optionally an electric heating means with an electrical circuit external to the reference environment space pass through the seal.

13. (currently amended) The~~A~~ sensor according to Claim 11~~ or Claim 12~~, comprising, in the reference environment space, a solid-state source of the reference molecules.

14. (currently amended) The~~A~~ sensor according to Claim 13, wherein the ionic species to be conducted is H^+ and the solid-state source is selected from a metal, a metal/hydride, a metal alloy/metal-hydride, any hydrated species, and any organic species.

15. (currently amended) The~~A~~ sensor according to Claim 13, wherein the ionic species to be conducted is O^{2-} and the solid-state source is selected from a metal, a metal alloy and a metal oxide.

16. (currently amended) The~~A~~ sensor according to Claim 15, wherein the metal is copper (Cu) and the oxide is Cu_2O.

17. (currently amended) The~~A~~ sensor according to Claim 15, wherein the metal is chromium (Cr) and the oxide is Cr_2O_3.

18. (currently amended) The~~A~~ sensor according to Claim 15, wherein the metal is nickel (Ni) and the oxide is NiO.

19. (currently amended) The~~A~~ sensor according to Claim 13, wherein the ionic species to be conducted is Ag^+ and the solid-state source is a silver salt.

20. (currently amended) The~~A~~ sensor according to Claim 19, wherein the solid state source is silver chloride.

21. (currently amended) The~~A~~ sensor according to Claim 11~~-or Claim 12~~, comprising, in the reference environment space, a liquid state source of the ionic species.

22. (currently amended) The~~A~~ sensor according to Claim 21, wherein the ionic species to be conducted is H^+ and the source comprises a liquid acid.

23. (currently amended) The~~A~~ sensor according to Claim 21, wherein the ionic species to be conducted is H^+ and the source comprises an organic liquid.

24. (currently amended) The~~A~~ sensor according to Claim 11~~-or Claim 12~~, comprising, in the reference environment space, a gaseous state source of the ionic species.

25. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein the solid-state ionic species conductor conducts H^+.

26. (currently amended) The~~A~~ sensor according to Claim 25, wherein the solid-state species conductor is selected from $CaZr_{0.9}In_{0.1}O_{3-x}$, $BaZr_{0.9}Y_{0.1}O_{3-x}$, $Ba_3Ca_{1.18}Nb_{1.82}O_{9-x}$, $SrCe_{0.95}Yb_{0.05}O_{2.975}$ organic membranes, inorganic membranes, polymer membranes, Nafion ™ and Nasicon ™.

27. (currently amended) The~~A~~ sensor according to ~~any of~~ Claims 1~~-to 24~~, wherein the solid-state ionic species conductor conducts O^{2-} ions.

28. (currently amended) The~~A~~ sensor according to Claim 27, wherein the solid-state species conductor comprises Yttria ~~Stabilised~~ Stabilized Zirconia (YSZ).

29. (currently amended) The~~A~~ sensor according to ~~any of~~ Claims 1~~-to 24~~, wherein the solid-state ionic species conductor conducts Ag^+.

30. (currently amended) The~~A~~ sensor according to Claim 29, wherein the solid-state ionic species conductor comprises a silver salt.

31. (currently amended) The~~A~~ sensor according to Claim 30, wherein the solid-state ionic species conductor is silver chloride.

32. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein the catalyst for the measurement electrode is the same as the catalyst for the reference electrode.

33. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein at least one of the catalysts comprises platinum.

34. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein at least one of the catalysts comprises ruthenium.

35. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein at least one of the catalysts comprises gold.

36. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein at least one of the catalysts comprises a ~~catalysing~~ catalyzing oxide.

37. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, wherein at least one of the catalysts comprises a silver salt.

38. (currently amended) The~~A~~ sensor according to ~~any preceding~~ claim 1, comprising means for monitoring a parameter of an electrical current produced in the cell, and means for calculating from the monitored parameter the partial pressure of the contaminant molecule in an environment on a side of the cell bounded by the measurement electrode relative to that on a side of the cell bounded by the reference electrode.

39. (currently amended) The~~A~~ sensor according to Claim 38, wherein the monitoring means comprises an emf measuring device electrically connected to the reference and measuring electrodes.

40. (currently amended) A method of detecting or monitoring the presence of a contaminant molecule in a monitored environment, the method comprising the steps of:

providing an electrochemical cell comprising

a measurement electrode comprising a catalyst selected for its ability to ~~catalyse~~ catalyze the dissociation of a contaminant molecule into its ionic species~~,~~;

a reference electrode comprising a catalyst selected for its ability to ~~catalyse~~ catalyze the dissociation of a reference molecule into its ionic species~~,~~; and

a solid-state ionic species conductor bridging the measurement electrode and the reference electrode, the conductor being selected to conduct an

ionic species common to the dissociated contaminant and reference molecules~~,~~;

providing, on a side of the cell bounded by the reference electrode, a source of the reference molecules~~,~~;

initiating the catalysis of the reference and contaminant molecules~~,~~;

monitoring a parameter of an electrical current produced in the cell~~,~~; and~~,~~

~~from the monitored parameter,~~ calculating, from the monitored parameter, the partial pressure of the contaminant molecule in an environment on the side of the cell bounded by the measurement electrode relative to that on the side of the cell bounded by the reference electrode.

41. (currently amended) The~~A~~ method according to Claim 40, wherein the monitored parameter is electromotive force.

42. (currently amended) The~~A~~ method according to Claim 40~~ or Claim 41~~, wherein catalysis of the contaminant molecule is initiated by heating the cell.

43. (currently amended) The~~A~~ method according to ~~any of~~ Claims 40~~ to 42~~, wherein the reference molecule is the same as the contaminant molecule.

44. (currently amended) The~~A~~ method according to ~~any of~~ Claims 40~~ to 43~~, wherein the catalyst for the measurement electrode is the same as the catalyst for the reference electrode.

45. (cancelled)